Subcommittee on Environment and Energy | MINUTES

Meeting date & time *February 20-21, 2024*
Meeting location *Federal Aviation Administration Headquarters, Washington, DC*

Purpose

Provide recommendations on R&D portfolio and direction

Facilitator

Anna Oldani, DFO

Note takers

Fabio Grandi

Timekeeper

Anna Oldani

Minutes from Meeting – Day 1

Presentation Welcome | **Presenter** *Anna Oldani*

Anna Oldani provided details on the logistics of the meeting. She then proceeded to introduce Peter Hearding, the Deputy Assistant Administrator for Policy, International Affairs, and Environment for his welcoming remarks.

Peter thanked the committee members for coming to the meeting and for their support and guidance to the work being done by the Office of Environment and Energy (AEE). He highlighted that environmental issues are a high priority and that Assistant Administrator and him have been talking about it to the new FAA Administrator. He lastly thanked the Research, Engineering, and Development Advisory Committee (REDAC) for the usefulness of the input the committee provides to AEE.

Peter followed by offering remarks on staffing and how the office is working on filling empty positions as they have by hiring Anna as the new Chief Scientific and Technical Advisor (CSTA) plus three new grant fellows hires. He followed by highlighting the excellent work being done by Julie as the acting Director of AEE and by Prem Lobo as the new AEE Energy division (AEE-500) manager. Peter then concluded addressing the concerns about new funding noting that he expected public private partnership will be funded for FY 2024 give the strong support they enjoy and that the office has been working hard on addressing the Grants approval timeliness given the challenges that delays cause.

Presentation Chair Opening Statements and Introductions | **Presenter** *Ian Redhead*

Ian Redhead welcomed everyone to FAA headquarters and thanked for joining. He then proceeded with the roll call of the attendees of the Subcommittee meeting, first with introductions by the remote members and then with the members in the room.

Presentation FAA R&D Update | **Presenter** *Shelley Yak*

Shelley Yak began the R&D update by thanking the committee for their contribution. She than provided a quick update on budget noting that the FAA is currently working under a Continuing Resolution expiring on March 1 and that the FAA is also working under a temporary Authorization expiring on March 8.

Shelley moved to discussing how aviation is in a state of flux and a period of great evolution. She remarked how the National Airspace system operations are evolving with more diverse operations and operators, with the introduction of distributed systems, and with the unprecedented pace of the introduction of new technologies. She noted how the Agency is thinking about the way the system is evolving and how the input from the REDAC is needed to help that process. As an example, Shelley highlighted how fast the pace of change has been for space transportation by showing a chart of the exponential growth in activity. Ian then asked what "Unlicensed Operations" represented on the graph to which she responded that those are the operation by the Department of Defense (DOD).

Shelley than moved to a discussion of her Office's activities related to the REDAC. She discussed how the prior week she met with the REDAC designated representatives to discuss the purpose of the Committee, how the goals portfolio could be optimized, and how it can provide context for the research. She also discussed the effort being undertaken to revitalize the committee by broadening the representation. She provided an update on the process by noting that they just have completed the Ethics and Legal review and that memberships will be addressed after the White House review. Shelley concluded by remarking on the number of steps involved in the process.

Presentation FAA AEE Update | **Presenter** *Julie Marks*

Julie Marks began her remarks saying that much is happening at AEE. She discussed the new hires with Anna Oldani as the Chief Scientist, Prem Lobo as the new Energy division manager, and the three new air fellows: Kenisha Ford and Theodore Johnson in the Energy Division, and Rukia Hassoun in the Emissions division. She then touched on the many ways applied research informs policy. She then noted how the Air Tour Management Plans work is progressing well; how the Environmental Review work is being supported by tools, policy, the understanding of issues associated with new aircraft; and a lot of collaborative work. She remarked on the work being done on commercial space as well as the support to the international activities of the International Civil Aviation Organization (ICAO) Committee on Aviation Environmental Protection (CAEP). She highlighted that the Office was finally able to publish the new Fuel Efficiency Rule and that it will be followed by work on non-volatile Particulate Matter (nvPM).

Finally, Julie remarked how the committee expertise makes for very constructive discussions and a very valuable input to the Office's program.

Ian asked if the updated staffing status chart from the last meeting could be provided to which Julie responded that it could. She then notes that the Office continues to focus on hiring given the few people doing a lot of work, but that hiring takes time and the fellows were a great option because they could be hired directly. She then added that if the committee knew of any good engineers to let us know as they can be hired directly under schedule A. Lastly, she noted that Prem was looking at a new person as well. With the goal of the management team fully staffed completed the Office is now working on staff level positions, especially for AEE-500. Barbara (Barb) Esker complimented the Office on the hiring progress given that it has been a long running need.

Brandon Graver asked what the contingency plans are for the FAA Reauthorization renewal. Julie responded that unfortunately this sort of situation happens often, and the Agency waits until the deadline gets closer as it takes a lot of effort to develop such plans. She noted there are people in the agency that will be able to continue working but otherwise everyone else by law cannot. The procedure allows the Office only a few hours to shut down in an orderly fashion and directions can be provided to contractors so they can continue working.

Juan Alonzo asked if the loss of people had put institutional knowledge in jeopardy. Julie answered it was great to be able to promote from within to maintain continuity and that there are great personnel left and that we try to avoid single points of failure. She also said that Jim Hileman and Kevin Welsh were doing too many things themselves so as the Deputy Director she made sure that new tasks would first go to staff instead and then have them review. This approach works well and gives the staff an opportunity to work the tasks and then get feedback the senior staff, which creates bench strength and exposes people to new things.

Anna remarked that fortunately she was already working with Jim on some of the activities, but that he was chairing and doing many other things are well. Her approach is to make sure to involve managers and staff, which requires changes in the way things are done, but so far has been working well. She concluded that she is open to any new ideas and new prospectives as well. Juan agreed that this is a good approach.

Julie then added that at the ICAO Committee on Aviation Environmental Protection (CAEP) Working Group (WG) meetings we try to send multiple people and that at CAEP meeting we also bring the largest delegation possible. Even internally we bring the staff in at presentations by the Office of Policy, International Affairs, and Environment (APL) leadership. Juan agreed that building Networks of people is also very important.

Ian remarked that he has done the same at his airport and that it requires to have confidence in the staff and people in the administration need to have that confidence as well. It goes beyond just data; relationships are extremely important. Julie noted as an example that there was hesitation by many people involved in the CSTA hiring process to the idea of hiring Anna. Barb added that the National Aeronautics and Space Administration (NASA) aeronautics also has the same problem, and that the FAA-NASA relationship is also very important and that is why she brings people to our meeting as FAA does to theirs.

Steve Alterman concluded by noting that he has been doing this work for a long time and that the prior discussion was very important. Being successful in this town is all about relationships and those relationships must be shared we the next generation, so he is very glad to see new people.

Presentation Industry Perspective | **Presenters** *Melinda Pagliarello and Brandon Graver*

Melinda Pagliarello began her remarks on the airports prospective by discussing how New Entrants might be an issue if they require new construction at airports given that they do not have space that is not already needed. She noted that in airport accreditation program level 5 construction emissions are considered. Given that 50% of passenger are going through one of the ACA airports, Scope 1 and 2 emissions have to be reduced as part of that. On the topic of the National Environmental Policy Act (NEPA), she remarked that the process is getting harder and harder with the Environmental Protection Agency (EPA) releasing a new non-attainment requirement and the National Oceanic and Atmospheric Administration (NOAA) also wanting to have consultation in the Northwest because of a product in tires being dangerous to a type of salmon. On the issue of electrical power, she stated that very challenging discussions are needed with the providers and airports are scrambling with things like the Hertz car rental company first saying that they were planning to have their fleet be fully electric in 5 years, which would require a lot of infrastructure, and just now saying they will not do so anymore. On Environmental Social Governance (ESG) Melinda remarked that it is highly political in nature, but that for airlines and airports is very real from the point of view of investors and with metrics coming out in the next couple of months. She noted that rating agencies and bond holders are asking about it as they are trying to understand risks in a new way and what can be controlled by airlines and airports. Lastly, Melinda addressed the issue of PFAS (Per- and polyfluoroalkyl substances) and PFOS (Perfluorooctanoic acid) and the fact that affected areas may become covered by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). If that will become reality, airports will be responsible for the liabilities and a lot of resources will be going towards defending from possible lawsuits.

Brandon Graver continued the session on the Airlines prospective by touching on the issue of non-CO_2 emissions and contrails. He noted discussions on the topic are taking the lead with the European Union (EU) trying to fit them in the Emissions Trading System (ETS), the Environmental Non-Governmental Organizations (NGO) coming up with roadmaps with operational solutions without understanding the impacts on air traffic, and a lot of theoretical research feeding all sorts of ideas that are not necessarily rooted in an understanding of how the system works. He remarked that NASA, the FAA, and the Defense Advanced Research Projects Agency (DARPA) are doing a lot of good work on the topic and encouraged continuing it since there is need to have more certainty on what will work, given airlines will be blamed if it doesn't, and their studies are helping advance the science.

Julie intervened acknowledging that NEPA is a problem, but that we are working with the Council on Environmental Quality (CEQ) to improve the process with new orders likely to apply going forward. On contrail, Julie remarked that the Office is developing a Roadmap in collaboration with other agencies and that a lot could be done, but needs to be understood.

Presentation NASA Update | **Presenter** *Barbara Esker*

Barbara Esker began her presentation listing the 4 areas in which NASA works to create transformation: ultra-efficient airliners, high-speed commercial flight, future airspace safety, and advanced air mobility. She briefly discussed the NASA budget by noting that the FY 2024 budget is being still discussed in congress, but that there is strong bipartisan support, while the FY 2025 will be rolled out mid-March.

Barb than began covering the high-speed commercial flight program listing its three phases. For the aircraft development phase, she highlighted the system testing is continuing and that the first flight is expected for the summer or early fall. On the Acoustic validation work, she noted that they have completed the risk reduction tests with ground units. On the community response testing, she reported it is an effort conducted in collaboration with AEE and that they are currently working on getting participants. She then added that they continue working on the international standards and that there is some interest outside of the U.S. to use the X-59. Lastly, she addressed noise and emissions and how NASA is working to reduce the uncertainties of modeling and expect to conclude the work later this year.

On the topic of advanced air mobility Barb started by remarking that there are a lot of challenges, but there are also many ideas, options, and opportunities and that a system solution will be required. She noted NASA is looking at tools for noise and performance modeling tradeoffs, fleet noise in collaboration with AEE, and power train reliability given the number of cycles they are going to be subjected to. Other areas of interest are crashworthiness, in collaboration with FAA, and handling and ride quality which is important for costumers. She then proceeded to highlight current activities.

Barb then moved to the topic of Subsonic airliner technologies by providing a summary of activity areas and work timeline. She highlighted how the Model Based Systems Analysis Engineering will allow them to bring all that is learned together. Lastly, she proceeded to provide updates.

In her final remarks she highlighted that aviation induced cloudiness (AIC) is getting increasingly more attention. Rich Wahls then added that the prior week there was a round table in which AIC was discussed. He remarked that everyone knows about the effect of carbons, but now non-CO_2 interest is growing and there is a lot of uncertainty on the impact of each individual trail and whether that impact will be warming or cooling. He noted there is a trade between AIC and Fuel Burn (FB) and the associated long lasting CO_2 emissions. Sustainable Aviation Fuels (SAF) are also coming online and have impacts on that that trade and very local weather conditions also matter with the associated temperature and relative humidity uncertainties. So much more data and modeling are needed and only two climate models incorporate contrails. Barb intervened noting that uncertainties are the key point, that they are collaborating with the Earth Science division, and that they did a flight test with the Boeing Eco demonstrator and the NASA DC-8 to collect Real time data. She concluded her presentation providing an overview of other important items on research area.

Presentation RE&D Budget Status | **Presenter** *Tennille Blackwell*

Tennille Blackwell began the session by providing as summary of funding over the fiscal years, including FY 2026, for which there will be a $1M redistribution. She followed by covering the Inflation Reduction Act (IRA) Section 40007 grants funding and noted that there were no changes. Tennille continued by covering the expiration dates for the Continuing Resolution (CR - March 1, 2024) and FAA reauthorization (March 8, 2024). She followed covering the amount of FY 2022 funding that remain unspent, the status of the FY 2023 planned expenditures versus actuals, and the status of the FY 2024 CR planned expenditures versus actuals. On the FY 2024 house budget she noted that FAA has been working through various options to continue the programs for which the budget has been zeroed, which includes twenty-four full time employees. On the FY 2025 President Budget request Tennille noted that nothing has changed, the numbers for FY 2026 are the numbers provided in the NARP, and that the Office of Management and Budget (OMB) plan is the same as the OMB enacted for FY 2023. For the out-years targets she highlighted that the numbers have been reduced compared to those shown at the last meeting and that they are working to provide the breakdown by BLI.

Melinda asked what FAA will do if the final appropriation includes the zeroed-out budget lines. Anna intervened saying that right now it is not expected to happen and that under the CR the office has some funding level, but only available to spend on emergency items.

Presentation Airport Technology R&D Update | **Presenter** *Jim Layton*

Jim Layton began by providing an overview of the activities on climate resilience starting with defining it as the capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment. The goal of the work includes developing prioritized risk-based recommendations and develop support tools. He continued by describing the Airport Resilience Analysis Framework (ARAF) tool being develop with the support of the DOT Volpe Center and by going over the project timeline. He then discussed having specific airport case studies and having a workshop as well as individual sessions with each airport. Jim discussed specific areas of quantifiable benefits and working on developing a dashboard to identify priorities and opportunities. He concluded by highlighting the next steps in the work and the website where information can be found.

Jim then moved the discussion to the activities on Firefighting foam and the continued efforts to develop new products formulations. He reported that they are working with the Navy on two 2 approved formulations and have been doing testing, to which Melinda noted that the test results were not as hoped. He then concluded remarking that the F3 Military specification had been released.

Jim concluded by touching on the research on Sustainable Pavement Research. Work includes the evaluating of Warm Mix Asphalt, advanced characterization of paving materials and Life Cycle Assessment (LCA). On the latter Julie commented that if is very important work both domestically as well as in ICAO as there is a task related to climate planning.

Presentation Responses to REDAC Recommendations & Actions | **Presenter** *Anna Oldani*

Anna Oldani stepped through the 7 recommendations from the 2023 Fall Committee Meeting and the associated FAA responses. She then reviewed the 6 action items from the same meeting noting that the action related to the sharing the OSTP document with the REDAC participants was closed, while the other where still open.

Presentation E&E Research Update | **Presenter** *Anna Oldani*

Anna Oldani started her briefing with background information on AEE and its organizational chart highlighting that a new position had been added for a frontline manager for the budget staff (AEE-4). She then reviewed the slide on AEE's uses of research noting that a few new areas had been added and that the R&D work performed is all in support our activities. She remarked that the graphic in the slide is new and is not in the trifold since it did not fit which forced us to only show the top levels. She then followed with the list of recent successes spanning across all the different aspects of the portfolio. Within that she highlighted the ICAO Third Conference on Aviation Alternative Fuels (CAAF/3) as an example of our research being able to inform. However, she also noted that the Office had to push back on what ICAO had asked of us since we did not think if was proper. She then moved to an overview of the history of the Office's R&D budget remarking that we had been in the situation of potentially lower budgets before, but that budget increases have allowed for programs expansion with many projects started under the ASCENT Center of Excellence (the Aviation Sustainability Center also known as the Center of Excellence for Alternative Jet Fuels and Environment – AJFE) which now we have to manage in terms of funding and staff time.

Anna continued by giving an overview of the Range of R&D work under the Office's purview, highlighting the partnerships established for developing tools to support required analyses, and listing past and current analyses. She then provided highlights of the Continuous Lower Energy, Emissions, and Noise (CLEEN) program and of the SAF development efforts on testing, analysis, coordination, and development. She followed with an overview of the research on non-CO_2 impacts following which Barb asked when the update the climate action plan will be ready and Julie replied that it will completed as soon as possible. Lastly, Anna addressed work being performed on noise across vehicle classes which includes activities on tools development and measurements, to which Dimitri Mavris remarked that emissions will be a problem and Space emissions need to be addressed.

The presentation then moved to a discussion on the ASCENT Coe grants program. Anna began with an overall summary of the program specifically remarking that students' growth is a very important element of the program and noting several in the Office staff come from the COEs, with herself and Ana having been part of ASCENT and Chris and Laszlo of its predecessor PARTNER. Dimitri then asked about renewal of the COE and Anna responded that we are working with the Grants Officer and that the program is going to renewed for multiple years, somewhere between 2 and 5 years, and that it is also generally asked for specifically by name by congress in the appropriation language. Ian asked how other universities could be added to which she responded that a center of excellence is created through an open competition and right now

while other universities could no join they could partner with members of the existing team. Anna then continued by providing details on the COE productivity and Barb asked what level of students participate to which she replied that it is mostly graduate students, but that also undergraduate can participate. Dimitri added that now there are a lot of regulations that prevent the universities from using students (e.g. NDA's). Lastly, Anna went over the upcoming center meetings noting how instead of a single meeting the spring meeting is now divided into multiple meeting, co-hosted with other events when possible, each focused on a specific research area so to help manage calendar constraints and provide more time for individual project's presentation.

The discussions concluded with a summary of the budget and highlights of the program including the work on CAEP, SAF, technology development, and noise and emissions research. Melinda asked if energy sources other than SAF will be covered in the 500 presentation and remarked that she was glad to see that we cover Hydrogen (H). She also asked who at FAA will deal with energy to which Anna replied it would be the FAA technology center and Julie added that the Office of Airports looks a infrastructure research. Melinda then asked if support for the global Long Term Aspirational Goal (LTAG) is on track to which Anna replied that the work is being done to develop a plan within the office and with other people in other working groups and independent experts. She also noted that there are some issues with SAF. Dan Williams intervened saying that there is need to understand what can be done with the available data, to which Melinda responded that some data requests from ICAO put airports in a legal jeopardy. Juan then asked about slide 15 on new entrants and how we can focus on things that will actually happen. Anna responded that the REDAC can support with prioritization, and that there is the need to also coordinate with NASA to ensure we remain in our respective domains. Barb added that NASA just had an event on hypersonic and will give Anna a debrief. Anna then continued that at the spring ASCENT focused meetings there is the opportunity for the researchers to provide their inputs as well. Juan concluded by saying some technologies are coming up quickly, while some like supersonic will also have to discussed as it does not seem plausible that it will happen soon.

Action items	Person responsible	Deadline
Provide a summary of staffing occupied and still available (an update to slide 6 from the Fall E&E Overview presentation)	A. Oldani	Fall Meeting

Presentation Update on ICAO and CORSIA Implementation | **Presenter** *Dan Williams*

Dan Williams started by providing an introduction on ICAO related activities. He noted how the US leadership lead the Third ICAO CAAF/3 event to success and highlighted how the Office's research activities, and those from other partners such as NASA and industry, critically inform international work in a close loop that builds upon itself. He remarked that LTAG and CAAF/3 need to work on building the capacity in other countries by developing good partnerships between industry and students. He continued by remarking on the 2021 Climate action plan

importance because of the stated goals and that the goal is update it on a 3-year cycle. Melinda added that for the last version her constituency provided airport emissions and that that Dan should coordinate to provide updates for the next version. Dimitri asked what the next steps in LTAG will be, to which Dan responded that they will be to develop a methodology to monitor progress, a topic that has sparked a lot of interest and that will require ensuring prior approaches are taken into consideration and there is no reliance on data that is not available. Dimitri then asked if the Secretariat is trying to get more data from the States and Dan replied that the US is consistent about only providing data that is available with Anna also commenting that the goal is to make sure it stays within what is reasonable.

Dan continued the discussion by touching on the dual stringency modeling efforts and noting that the related data is now sharable thanks to Department of State and a lot of work by Industry. Joe Zelina then remarked that they are still working on that as it was only cleared for CO_2 and Dan responded that the work on dual stringency can proceed, there is a meeting with Aerospace Industries Association (AIA) is scheduled for March, and that they are now looking at the Third Steering Group (SG3) meeting by which the dual stringency analysis should be well down the path of being completed.

The presentation moved to a more in-depth discussion of CAAF/3. Dan remarked how the meeting was a good opportunity to involve investors since research shows the need for a lot of funds and there is indication of a global momentum, which would be very encouraging for investors. He then noted that the near-term vision is in line with the LTAG scenarios and carbon intensity target with only a few states (Russia, China, Saudi Arabia, and Iraq) having not signed on the outcome, mostly because of process, and no backtracking on the LTAG and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) requirements. He stressed that an additional goal also being to keep ICAO away from having to do with distributing funding. Rich Wells than asked if the 7 billion gallon is consistent with the U.S. 3 billion goal, namely if the 5% CO_2 emissions reduction by 2030 is consistent with 3B gallons of SAF in the US (used in a 50/50 blend). Dan replied that it is and that the 7 billion goal it is just for international aviation based on international demand, with the US and Europe being the largest components.

Lastly Dan moved the presentation to CORSIA reporting that the updated carbon neutral goal after COVID is 85% of the 2019 emissions, which will eventually include information on SAF. Then he remarked that the Reporting and Verification (MRV) program has been extended to 2026 and will aim to define the SAF offsetting for CORSIA. Barb asked if ICAO had developed a sustainability metric and any cost function that include noise, emissions, and SAF. Dan replied that ICAO used to do one metric at a time, but this cycle the dual stringency analysis is looking at two metrics concurrently to support both standards even if adding more metrics makes the analyses even more complex. Dimitry than added it becomes a 3D surface so difficult to visualize and that LTAG tried to add some on economics.

Brandon concluded the session by stating that he highly commended AEE and staff on the leadership at ICAO even without support by it. Dimitri added that it is a fulltime job that requires working within the system with lot of work taking place behind the scenes.

Presentation Aircraft Technology Research | **Presenters** *Arthur Orton and Christopher Dorbian*

Arthur Orton opened the session by providing an overview of the CLEEN program which aims to get technologies to a development level ready to go into manufacturers product development. He covered the technology targets for the for the first three phases of the program noting that at the beginning the program tried to align to NASA's goals (Phase I - N+1) and remarked that the noise goal has been challenging especially given the interdependencies the various goals. Ian asked how long it takes for the new technologies to go into production, to which Arthur replied it takes five to seven years from a Technology Readiness Level (TRL) 6 and Dimitri added that TRL 6 is also the level used to determine which technologies are to be included in the CAEP planning.

Arthur continued by covering the status of the work under CLEEN III and listing the most recent program accomplishments by the various manufacturers. He followed by covering the upcoming milestones and by discussing the assessment activities by ASCENT Project 37 on physics modeling of the technologies, their application in the fleet, and the projected future benefits in 2050 in terms of fleet wide estimated fuel burn (FB), Carbon Dioxide (CO_2), Landing and Take-off (LTO) Nitrogen Oxides (NO_X), and noise reductions. He also noted that benefits at the vehicle level cannot be reported as the analyses involve the use of proprietary data, but that AEE is working with the university to devise a method to provide a finer detail. On that point Joe asked whether is would be possible to separate the data into its Aircraft and Engine components, to which Arthur replied that potentially it could be done by that we will have to ask.

The discussion then moved to an overview of CLEEN IV, the next phase of the program modelled after the prior ones. Arthur reported that the team will have to do a market survey and that the solicitation for proposals will be out in 2024, if funding will be available at same level, with awards expected in 2025. The goals for the program, now still at the draft stage, will once again aim to stay aligned with those of NASA’s Sustainable Flight National Partnership (SFNP) and affect the next generation aircraft (single aisle being the most impactful). He then remarked that NO_X represent a challenge at higher engine temperatures and pressures and that in this new phase they will be addressing the full mission emissions.

Arthur proceeded in his presentation by covering the ASCENT technology related projects. He highlighted how the projects are designed to complement the CLEEN activities since, while CLEEN addresses specific proprietary technologies, ASCENT focuses on improving tools, tests, and more generic technological aspects. He concluded by noting that there the Office will try to align ASCENT Project 96, Future Transportation System Opportunities and Constraints, to the work NASA is doing under the Advanced Aircraft Concepts for Environmental Sustainability (AACES) 2050.

The discussions concluded by covering the new FAA Fueling Aviation’s Sustainable Transition (FAST) discretionary grant program with a quick overall overview followed by more detailed discussion of the FAST-Tech portion, which is focused on fostering the development of Low-Emission Technologies. Arthur updated the group on the status of grants awards process, on the partnership with NASA on SFNP and aligning goals, and the overall interagency coordination with NASA, DOD, and other agencies. Sandy Lancaster asked what reporting requirements would in place in terms of results for the recipient of fast tech grants to which Christopher

responded that while we have included reporting requirements in our program and will have similar quarterly and bi-annual meetings, grants have by design less burdens on the awardees.

Discussion Findings & Recommendations | **Lead** *Ian Redhead*

The Chair began the discussion about the Finding and Recommendations by noting that at this point he did not see any changes needed to the committee's current Findings and Recommendations. He then asked if anyone had any other ideas about items to add or change, non were presented.

The Chair closed out day 1.

END OF DAY 1

Minutes from Meeting – Day 2

The Chair started Day 2 with a quick overview of the agenda.

Presentation Energy Research | **Presenter** *Prem Lobo*

Prem Lobo began his presentation by providing a description of the goals of the new AEE Energy division and by introducing the members of his team. After a brief introduction of the topics that will be covered, Prem continued is presentation by discussing the opportunities associated with the development of SAFs, which consist of: being a drop-in replacement to conventional Jet fuel; providing a reduction in lifecycle emission; being a viable technology with 8 pathways and 3 co-processing already approved; having scalable feedstocks; being widely accepted by industry; and being broadly supported by governments. He then addressed the associated challenges: the currently limited production capability; the efforts required for fuel qualification; the 50% blend limit; the credibility of the afforded Green House Gasses (GHG) reductions; and the current cost and need for incentives to support expanded production. Ian then asked about the reason for the 50% blend limit, to which Prem responded that it was the result of a safety requirement, and that work is underway to increase it. Ian then enquired about those flight that had been publicized as having been conducted using 100% SAF. Prem noted that those were all maintenance flights with no passengers and that there were also other flights by Original Equipment Manufacturers (OEM) that were done to assess fuels performance. Prem continued the SAF discussion by highlighting the SAF program focus consisting of activities on testing, analysis, coordination, and deployment.

On the topic of testing, he noted that that a new pathway and a new co-processing have been approved, that other pathways are also being considered, and that lot of companies are engaged in exploratory discussions. To that Ian asked who is responsible for tracking of SAF production and Prem responded that ICAO has a group focused on that which is in charge of tracking global projections and that there is also a feasibility index to identify which announcements are likely to happen. Joe asked if it is possible to have a blend that meets Jet A fuel composition specs for meeting emissions testing certification requirements to which Ralph Iovinelli responded that more clarity is needed from ICAO as that is a gray area. Anna also added that once blended as recertified for the specifications, a fuel should be undistinguishable and therefore it is uncertain what would make it ineligible for use. Barb then noted that she would be interested on the outlook on manufacturing production and availability and that the committee might like to have a presentation on the topic. Prem then continued by covering the complementary work being done under ASCENT, with specific focus on Project 90, World Fuel Survey, which is looking at global fuels properties as they change depending on the source and might affect the blending. Catalin Fotache asked what is affected by using 100% SAF besides seals to which Prem responded that seals are the main issue, but also dielectric properties and effects on materials can be issues that need to be addressed given that current aircraft are expected to remain in the fleet for a long time still. Catalin asked if there is actual evidence and Anna notes that there are identified issues with dielectric properties and acoustic instabilities, predominantly with single and double molecules.

Prem then moved to the topic of SAF testing under CLEEN with a summary of the work by Boeing and GE Aviation and how it also links to the activities under ASCENT. He noted how

GE found cycloparaffin fuels hard to source and have been looking at alternatives working with Shell, which had some technical challenges, given the test requires a lot of fuel. Barb asked how active the DOD is in this space and Prem responded that they are doing a lot of work on compatibility, but that it is classified. Ian than asked if that is to our detriment and if the committee should make a note about it, to which Anna replied that Air Force Research Laboratory (AFRL) was working with the National Jet Fuels Combustion Program (NJFCP) closely because of someone who was very supportive of it, but now that he has left it is no longer a priority for them. She also noted that the University of Dayton Research Institute (UDRI) also has a good relationship with DOD, but for the last two years they had stop using their labs, which increased costs and added challenges for our work. Prem then remarked that the individual was also a key element in getting fuels and distributing them and that his departure is one of the reasons why our program started the fuel repository, which allows us to make transactions with manufacturers easier when having higher volumes requests.

Prem moved his presentation to the topic of analysis by providing an initial overview of the work being done on SAF supply chains. Melinda asked if there is research that informs the conversations on the competition on resources from the road and marine sectors. Prem responded that Volpe is looking at that aspect since they have access to data for those sectors and that they will provide an update in the near future. She then asked if it would be helpful to the lobbying activities to have better information and Anne remarked that tracking hydrogen would be the best source of information for that purpose and added that currently a lot of the output is renewable diesel, but facilities generally produce both. Barb noted that FAA was working well with DOE and the U.S. Department of Agriculture (USDA) and asked if that collaboration is still ongoing, which was confirmed. Ian asked if FAA is working with USDA on feedstock sources. Prem responded that topic is covered under the ASCENT Project 1, Alternative Jet Fuel Supply Chain Analysis, but that we partner with USDA as they lead those efforts under the GC given they have programs to incentivize production of feedstocks.

Prem continued his presentation with an overview of the work being done under ASCENT Project 93 and its objectives: identify waste and biomass feedstock availability; analyze new pathways to optimize SAF production; assess infrastructure needs and logistical requirements for a holistic approach to SAF supply chain development; and develop a network of doctorate (PhD) students to work with universities in the regions of interest to extend supply chain analysis techniques and tools (and training modules). As an example, he mentioned that Kenia as an old refinery that could be repurposed which is connected to pipelines and is near the coast to receive feedstock and that we have been seeing meaningful progress in that country. He then remarked that unlike the European Community (EU) programs, this program has an educational component. Ian then noted that when discussing the work being done under ASCENT Project 93 the word 'global' should be added along 'network' since the work is global in nature and that aspect should be highlighted. Ian then asked if the work is funded by the U.S. to which Prem replied that is the case of for the universities, but that the World Bank and other entities have funding to support these programs. He noted that we run workshops to teach how to develop proposals to get access to those funds, but that for now we are focusing training to Latin America as they have specifically asked. He added that they will get a certificate from Washington State University (WSU), which is in addition to the PhD program WSU as is also in the process of developing.

The discussions then moved to a quick overview of additional ASCENT projects. Project 52 looking at the comparative assessment of electrification strategies for aviation, including hydrogen, as part of which the Massachusetts Institute of Technology (MIT) also reached out to NASA Kennedy. The Project 99 on conceptual Analysis of cryogenic hydrogen Distribution to airports, which is still not awarded. Prem noted that this project will consider the work being done under the National Academies' Airport Cooperative Research Program (ACRP) and that the two combined should provide a good understanding of the topic. Barb remarked that the team should reach out to the NASA Kennedy as they work with hydrogen and might have insights. Rich Wells concluded the discussion by adding that NASA hosted a cryogenic fuels workshop at the NASA Glenn Research Center (GRC) in September 2022 and that he also brought the NASA cryogenic fuels experts into the ICAO LTAG discussions to share the Kennedy Space Center experience on fueling, catering, and passenger embarking and debarking (not done at the same time as fueling).

Prem continued the session by addressing the topic of coordination. He began by covering the work being done under the ICAO Fuel Task Group (FTG) on: developing default core LCA values; developing Induced Land Use Change (ILUC) emissions; evaluating the impact of Soil Organic Carbon (SOC), biomass sequestration, and Carbon Capture Utilization and Sequestration (CCUS); developing LCA methodology for Power to Liquid fuels; updating projections of global SAF production; updating State resources on SAF topics; and working on a new task on SAF Accounting and Reporting Systems. He then discussed the SAF GC by providing an overview of the program's aims and roadmap. He covered the program's Stakeholder outreach and engagement, which is a focus for both the GC and the CAAF activities. Dimitri asked a clarification on the GC to which Prem responded that it is an entirely voluntary program with a framework proposed by the US Government which also formalizes the coordination between agencies. Brandon asked how much the FAA interacts with the individual States as they develop their own plans for decarbonization, and Prem clarified that those discussions and coalitions are handled by CAAFI. Dimitri asked if there is the consideration to have a competition for universities to provide their input and Prem clarified that approach would work for feasibility studies. Melinda remarked that there is a lot of duplication of efforts at the state level. Lastly Brandon noted that there are many questions about tax incentives and asked what policy mechanisms would keep fuel from going to other states to which Prem replied that the States are currently having those discussions.

Prem concluded his presentation with an overview of a new SAF Lifecycle Working Group AEE established to meet the needs of the SAF Grand Challenge. He than provided an updated on CAAFI's personnel changes and activities. Lastly, he covered the latest numbers on SAF production, the projected production levels out to 2030, and the Inflation Reduction Act (IRA) funded Tax Credits and FAST grants program.

Action items	Person responsible	Deadline
When discussing the work being done under ASCENT Project 93 the word 'global' should be added along 'network' since the work is global in nature and that aspect should be highlighted.	P. Lobo	none

Presentation DOE Bioenergy Technologies Office (BETO) Update | **Presenter** *Jay Fitzgerald*

Jay Fitzgerald began his presentation by reviewing the Office's mission of developing and demonstrating technologies to accelerate reduction of GHG emissions through the cost-effective, sustainable use of biomass and waste feedstocks across the U.S. economy. He then touched upon the strategic goals of decarbonizing transportation, industry, and communities noting that for transportation SAF is the most important element. He than discussed the program areas under BETO, how it is looking at feedstocks, and noting that the 2023 billion-ton report will be published shortly. He then mentioned the BETO 2023 project peer review is where all projects are covered and the material is all posted online.

Jay continued his presentation by discussing the transportation decarbonization blueprint developed in collaborations with other agencies, which shows fuels by sector and aviation having no significant near option besides the use of SAF. He discussed a study looking at potential mature conversion technologies noting that the ability to meet needs is in range and encouraging a review of the related publications. He discussed how the new Billion-ton report is an updated of the 2016 reports with key updates introduced and how their FY24 investments will focus on opportunities related to Energy crops and in collaboration with USDA.

Jay followed with a discussion on SAF related topics. He mentioned the upcoming announcement of the DOE Earthshot initiative, which will focus on SAF given that no other energy inputs are expected to become available for aviation in time to support the 2050 goals. He covered the related work being done by the other DOE offices, the SAF GC, the SAF portfolio and Funding Opportunities metrics, and their support for the FAST program.

Ian thanked Jay for the presentation and expressed his hope that the communication will go both ways given that SAF is what is needed to meet the 2050 goal. Anne confirmed that we would be available to give a presentation to their office at any time. Barb also complimented Jay for his presentation and noted that it would be valuable to have a similar presentation from the USDA. Prem added that CAAFI will have webinars with all the agencies on the SAF GC. Anna commented that the DOE presentation included slides that help explain how they are supporting development of the technologies they are supporting. Melinda remarked that there is a lot revolving around energy crops to which Jay replied that the resource analysis done has identified low hanging fruits but that it is not enough and longer term we will need to start investing in the feedstocks needed in the future to get to the 2050 goals. He noted that energy crops are critical and for aviation the goal will not be achievable without algae and energy crops and that the billion-ton report is careful in considering competition with food and feed, without which the reported available amount would be three to four times higher. Rich commented that he very much liked the transportation chart and associated energy sources uses and noted that there is also a hydrogen chart and a goal by 2050 with a percent with H as a feedstock for SAF. Jay responded that the hydrogen Office is the sister office, they developed the hydrogen road map, and that they are trying to work more closely to assess hydrogen use by the transportation sector. Rich noted that it is consistent as it reinforces the importance for SAF and that the EU estimates that 50% of SAF by 2050 will be from power to liquid hydrogen. Jay confirmed that a lot of the pathways require H and the Hydrogen office is looking at the optimal use in fuel production. Catalin concluded that the EU approach sees hydrogen as a direct fuel while US is mostly or only looking at SAF, to which Rich added that the EU is however revising that approach.

Presentation Emissions Research Activities | **Presenter** *Ralph Iovinelli*

Ralph Iovinelli started the briefing by showing the overall structure of the emissions research roadmap and then moved to addressing specific topics. He began covering ASCENT Project 18, Airport Monitoring Emissions. He explained that the measurements were done around Boston Logan (BOS) with very active communities and many other activities next to the airport which posed a challenge to completing the 5-year long project. Since it was important to identify the sources for culpability given all airports are different, they adopted a different approach to monitoring with both stationary stations and mobile monitoring which allowed to explore emissions at different areas showing the variation by location. The measurements included counting Particulate matter (PM) by second as well as looking at the particle size distribution, which is important to identify sources. The project met the study objectives and developed a best practice report to provide guidance to other studies intending to better characterize an airport. The study showed through spatial-temporal exposures the effects of dispersion on local pollution and indicated that not all parameters are of equal importance in emissions exposure. The timing for this project was also very fortunate because the pandemic allowed to take observation both while very little air and the ground traffic was present as well as after the recovery, which enabled the assessment of relative contributions. Since surface Traffic returned more quickly it allowed to establish the strong contribution of ground traffic to particle emissions. He concluded noting that the project is now going to repeat the measurements at Washington Dulles (IAD) since it provides a very different surrounding environment and that Melinda coordinated with the Metropolitan Washington Airports Authority (MWAA), which have been very helpful.

Ralph then discussed Project 19, Aircraft-specific Dispersion Model Development and Validation, where they are coordinating with EPA on their dispersion modeling tool to develop a dispersion model specific for aircraft and ensuring it is supported by a regulatory update to the EPA's Guideline on Air Quality Models. He then highlighted the coordination between project by remarking on the fact that the BOS data from A18 will provide the data needed to validate the new dispersion model. He followed with a review of the microphysical modeling of Volatile Particulate Matter (vPM) work being conducted by Aerodyne, covering its three phases of the work with the goal of updating and improving the methodology as well as the related ICAO documentation.

Ralph then addressed the work under ASCENT 69 on nonvolatile Particulate matter (nvPM) by providing an overview of the goals to improve the methodology and be included in ICAO and SAE documents, but he also reported that the project had been significantly delayed by COVID. He touched on project 58, Improving Policy Analysis Tools to Evaluate Higher-Altitude Aircraft Operations, which aims to increase understanding and tools in order to support policy development and decisions.

Regarding Ascent 22, Evaluation of FAA Climate Tools, he noted the project aims to use comparisons to foster identification of necessary updates and improvements needed to climate tools. Lastly, Ralph touched on projects 91 A and B, Environmental Impacts of High Altitude and Space Vehicle Emissions, which look at scenarios out to 2050 that include varied fuels. He noted that the scenarios have been developed, are now being modeled, and that the work should finish soon.

Ralph concluded his presentation noting that the ongoing research has been supported by the REDAC and reminding the committed of the upcoming Aviation Emissions Characterization

(AEC) meeting taking place in May. Ian congratulated on the end of the BOS study and remarked that it is very good for airports, to which Ralph noted that the report will be coming out soon and will be posted on the ASCENT website. Melinda asked if the result have been compared to other studies and Ralph responded that our research team has been consulted about the benefits of this approach by airports currently potentially exposed to litigation and has informed the approached used by other people by focusing on the science. Lastly, Dimitri asked if the scope of the high-altitude work includes the burning of debris during re-entry since there has been talk about burning 'trash' in the atmosphere, which was confirmed.

Presentation Addressing Climate Impacts from Aviation Induced Cloudiness | **Presenters** *Nicole Didyk-Wells and Chris Dorbian*

Nicole Didyk-Wells began the presentation by providing an overview of Aviation Induced Cloudiness (AIC) and non-CO_2 impacts in general. She discussed the magnitude of those impacts and the associated level of uncertainty in comparison to that of CO_2 and covered how persistent contrails are impacted by multiple factors: fuel chemical composition, aircraft and engine technology, meteorology, and local radiation budget. She observed that AIC impacts could be reduced through the use informed operational decisions and concluded with an overview of ongoing research on AIC.

Nicole continued the discussion by covering the relationship between SAF and AIC and the efforts to understand its relative impact. She talked about the impact of fuel composition on emissions and contrail formation and how with the use of SAF the amount of water vapor produced increases while the quantity of Black Carbon available to nucleate ice decrease. Nicole then covered the measurement activities being conducted under ASCENT Project 02. These activities include measurements that range from looking at a single combustor to performing full in-flight campaigns. They also cover a variety of fuels and the impact of engine lubrication oil on the results of the measurements. She reported what measurements were performed as of October 2023 and noted that NASA's DC-8 test aircraft was being retired and that the work will now have to be rely on the new 777 test aircraft. She also noted that FAA was able to provide $3 million worth of fuel to the work and that the results should be ready by the next FAA AEC meeting in May. Lastly, she provided an overview of additional research activities on technologies that will affect AIC formation.

Nicole concluded her portion of the presentation by giving an overview of the Contrail Avoidance Support Tool (CAST) tool. She explained that it provides an observation-based near real-time forecast of contrail forming regions with a forecast valid at short lead times. She noted that while CAST is a good tool, it is still in development. Barb asked if other partners are also using it as she was wondering about operational implications and Nicole replied that several are working with different tools. Melinda then asked if there are any connections with turbulence since that seems to be becoming worse and any relation between the two would make the use of such tools more palatable, to which Nicole responded that research has not addressed such connections. She then proceeded to show two videos of the tool in action describing what they showed.

Chris Dorbian took over the conversation on operational tools confirming that indeed there are multiple entities pursuing tools and all with operational implications. He described how the tools

can be planning or tactical models or provide a combination of the two. Planning tools focus on use by airlines by identifying route adjustments, provide optimizations specific to the operator's objective, and are generally narrow looking at individual flights. Tactical tools instead take a system-wide approach and have limited airline specific visibility. He continued saying that these tools can have impacts on safety given the added procedures and complexities and highlighted that we need to identify what protocols or tools will be needed to safely achieve the desired procedures. He noted that more stakeholder engagement is needed to identify gaps, user needs, and approaches to address questions and that currently AEE is in the early stages of working with MIT and MIT-LL. Shivanjli Sharma commented that she will follow up with Chris for potential collaboration as digital twins and simulations might help start the assessment without causing actual disruptions to the NAS. Melinda asked if AEE is working with FAA's Air Traffic Organization (ATO) and bundling up requests to them to facilitate coordination, to which Nicole responded that the Office is trying not to overburden them but the topic of involving ATO's weather team was just briefed to management. She than added that EU is trying to develop contrail avoidance capabilities quickly, but things are still too uncertain and we need to help them understand associated impacts. Chris added that the challenge is that we do not know yet the details, so we want to start slowly with getting their feedback and then once we are clearer on details, we can involve management. Ian then asked that the committee be given an update on progress at the next REDAC meeting.

Brandon remarked that it is important to have the initial discussions, but that we do not know the whole impact and operational changes would be premature not having a baseline. Not knowing how good the predictions are, efforts should first focus on those areas where contrail are known to occur, which would help reduce the stress on ATO. He concluded that research should try to pinpoint where the biggest benefits will occur which would ensure airlines' participation as they would like to avoid contrails without the passenger even knowing it. Barb remarked that she agreed, especially on reducing uncertainties to avoid more harm than good, and that is where collaboration with atmosphere scientists from NASA would be critical. Brandon then added that more aircraft could be instrumented if cheaper equipment to install could be obtained. Nicole followed by noting that DOE is developing new sensors, but uncertainty remains the major issue to address as satellite data will not be available until the 2030s and the current trial activities are aimed at showing the difficulties. She added that work could focus on imagery to identify those areas Brandon was referencing to, but also that the use of SAF adds additional unknowns at this time, which is the reason for the measurement campaigns, which are however expensive.

Action items	Person responsible	Deadline
Provide an update on Contrail Avoidance coordination activities at the next REDAC meeting	Christopher Dorbian	Fall Meeting

Presentation Analysis and Tool Development | **Presenters** *Joe Dipardo, Mohammed Majeed, Adam Scholten, and Jeetendra Upadhyay*

Mohammed Majeed began the presentation by providing an update to the development of AEDT version 3f. He noted that the team is working on software maintenance with specific focus on

upgrading the codebase to .NET version 4.8 while the planned upgrade to the new version of the ESRI Geographic information System (GIS) software component has instead been deferred. He continued with a review of the ongoing emissions modeling updates which include: improvements to both aircraft and non-aircraft emissions modeling and reporting, and the inclusion of CO2, Methane (CH4), and Carbon dioxide equivalent (CO2e); implementation of the CAEP nvPM Mission Emissions Estimation Methodology (MEEM); run-up/maintenance emissions and dispersion; and Fuel flow rate adjustments for taxi emissions (SAE AIR-8035). On emissions dispersion modeling Mohammed noted that the update of AEDT to the new EPA AERMOD/AERMET model version 23132 allows access to additional capabilities including PM 2.5 emissions dispersion modeling for periods less than a year and volume source characterization. Ian asked what the impact of deferring maintenance will be, and Mohammed replied that the team is working on the details, but it will not affect the users and that the upgrade was required by the Information Technology (IT) department.

Joe Dipardo took over the session to discuss the future development plans for AEDT. He began with the work that will be done on AEDT version 3g which will include some more updates before the new family series will be released. These updates will include: fixes to Time-above calculations; complete modeling for Supersonic Transport Aircraft (SST), a capability needed for CAEP modeling and requiring full flight FB modeling and some fixes to the tropopause weather model; use of operational profiles in run-up emissions dispersion modeling; comma-separated values (CSV) file format import capability; and resolution of additional maintenance issues. Joe than reviewed the AEDT 4x series planned development activities which will include code base maintenance as well as noise and emissions modeling updates. Maintenance will include updating to .NET 8, the harmonization of the methods within the aircraft performance module, and a full upgrade of the ESRI GIS to version 200.x. On the latter he noted that it will be a very significant effort as ESRI rewrote their code base, but it will be necessary as continuous updates are a drain on budget and development resources. For noise modeling the expected updates will include improvements to aircraft noise characterization, enhanced ground impedance and terrain modeling, and improvements to the helicopter database. Lastly, emissions modeling updates will cover validation of plume rise implementation in AERMOD, aircraft-specific dispersion model, and weather modeling harmonization.

Adam Scholten concluded the session with a discussion on the Office Inventory modeling activities and sharing of the resulting data. He began with an update on the status of the year's inventory modeling, the results of which are used for reporting to other federal agencies, informing research, environmental screening activities, and for trend analysis within the Agency. He provided a listing of the inventory output which include: the noise contour area and population exposure counts; FB; and emissions of CO2, Hydrocarbon (HC), Carbon Monoxide (CO), NOX, Sulfur oxides (SOX), PM, Lead, and Hazardous Air Pollutants (HAP). Adam then provided an overview of the latest improvements which also included the addition of more GA airports, improved mapping for GA aircraft based on the FAA registry, and inclusion of FB and Lead emissions modeling for piston-powered GA. He concluded the topic by discussing how future improvement will add better integration to the FAA Enterprise Information Management system, continued improvements to the background data processes and GA modeling capabilities, improvements to military operations modeling, and better integration to the Environmental Visualization Tool for access to inventories inputs and outputs.

Adam completed his portion of the presentation with a discussion on the Office effort on wider sharing of the Inventory data. He remarked that these data are based on the best available resources for detailed flight operations and 4-dimensional trajectory information and that one of AEE's key goals is to share our inventory data both internally and externally so to ensure that all environmental analyses are based on this consistent quality baseline. He then concluded by providing a list current input, noise, and emissions data sharing internal and external initiatives.

Presentation Noise Research, Briefing and Discussion | **Presenter** *David Senzig*

Dave Senzig began the presentation with an overview of the key areas of the FAA noise research program: the effects of aircraft noise on individuals and communities; modeling, metrics and data visualization; and reduction, abatement and mitigation. He continued by covering the work being done under ASCENT project 3 on evaluating potential links between health and economic impact and aircraft noise exposure. In noted that the cardiovascular disease study was expanded to include three additional cohorts and that it will be working on assessing intermediaries, such as adiposity and diabetes, and metal heath outcomes. He continued by providing updates on activities on the sociodemographic patterning of aircraft noise exposure and its association to hypertension, cardiovascular disease, sleep duration and quality, and adiposity.

On the economic impact noise study, Dave discussed the results of the change analyses conducted by MIT which showed that there are no impacts to business. The work also showed that there is no impact on housing prices, even after controlling for confounding factors. He added that that the same conclusion was reached looking at the data for the Seattle airport to which Melinda noted that there might be more interest for these latter results given the current law suites in the area. He then continued by covering the national sleep study and reporting that all the data has been collected and showing the graphic reporting the progress on the acoustic analysis. He followed with an overview of the laboratory study being performed under ASCENT project 86 on the use of broadband noise to mitigate sleep disturbance.

Dave continued his presentation by providing an update on the work being done under the ICAO CAEP for the dual stringency standard analysis and Rudramuni (Muni) Majjigi noted that the work has been challenging, but it is now progressing very rapidly, especially since the data sharing restrictions have been lifted, and that the work should be completed as planned. Dave continued by discussing the SST work and Brandon asked if the OEMs have been affected by the delays of the NASA X-59 program, to which Muni replied that they have not since they are not targeting low boom technology. Dave then provided a review of the Domestic work highlighting that NASA also presented their work at the CAEP Working Group 1 meeting and Muni added his thanks to the NASA team for their support and their technical abilities which allow the Office to maintain US leadership on this international work.

Dave concluded his presentation by providing a summary on potential opportunities on noise related activities provided by closely collaborating with NASA on large ground and flight demonstrations, the increase in engagement with them on a variety of other activities, and the potential of the FAST-Tech grant program elements focused on enhancing test capabilities having noise technology collateral benefit. Lastly, he remarked that the new CLEEN Phase IV program will be holding the noise goal at the same level as the prior phases.

Presentation Noise Research on UAS and UAM | **Presenter** *David Senzig*

Dave began the session with a slide on the definition of Advanced Air Mobility (AAM), Unmanned Aircraft System (UAS), and Urban Air Mobility (UAM), as it was requested at the prior meeting. He then remarked that a new definition will have to add to the list: Regional Air Mobility (RAM). Barb interjected that NASA had also struggled about the definition of these new entrant vehicles and said that she will share what they had developed. Julie Marks then added that the Office will have to reconcile with FAA's definitions, over which we have no control. Steve Alterman asked what the definition for regular vehicles being converted to unmanned systems would be, to which the response was that it was uncertain at this time.

Dave resumed the discussion by addressing the research needed on Certification methodology. He noted that the approach depends on the configuration. For tilt-rotor vehicles Appendix K could be used with different assumptions about the engine type. Certification for Lift + cruise vehicles will be based on the Rule of Particular Applicability (RPA). Dave then discussed the measurements and analysis being undertaken for UAS. Data are normalized to 400 ft and not measured at that altitude as it is difficult to hear. The normalization was based on appendix K, but it is being reassessed as it might not be appropriate. He then moved to an overview of ASCENT Project 38, Rotorcraft Noise Abatement Procedure Development, noting that the research is not trying to predict the broadband noise, but is current focusing on tones and that for ducted tail rotors they are currently working on the fenestron configuration. He followed with an overview of Project 49, Urban Air Mobility Noise Reduction Modeling, which does include addressing broadband noise and aims to develop initial capability to predict UAM acoustics, improve understanding of their noise characteristics, and identify noise reduction opportunities.

Dave discussed Project 77, Measurements to Support Noise Certification for UAS/UAM Vehicles and Identify Noise Reduction Opportunities, which is performing measurements on actual drones, with on of them being rSaneconfigurable. The project is looking to reduce noise by controlling the phase of the propellers, which however will only be effective in a single direction and may make the noise worse in others. He then provided an overview of Project 84, Noise Modeling of Advanced Air Mobility Flight Vehicles, which aims to develop AEDT compatible noise modeling methods for AAM vehicles for community noise predictions. An action was then taken to confirm that data collection on AAM/UAS vehicles is fed to model development. Lastly, he provided a review of the work under Project 94, GIS Based Probabilistic UAS Trajectory and Noise Estimation Tools and Methodologies for Upcoming Vehicle Concepts, noting that the work aims to develop a way to model real world operations for these vehicles.

Dave moved the discussion to Helicopter research and the Fly Neighborly program which works to develop noise abatement procedures (NAPs) and train and encourage voluntary use by pilots and noted that the work is transitioning to a new program. He then provided a summary of other programs being undertaken in collaboration with NASA which include a variety of working groups, NASA AAM national campaign, and the FAA-NASA UAM community noise test planning. Dave concluded with a list of the Office's industry and international collaborations.

Action items	Person responsible	Deadline
NASA to provide the definitions they developed for new entrant vehicles (e.g. AAM, UAS, etc.).	B. Esker	Spring Meeting
Confirm that data collection on AAM/UAS vehicles is fed to model development	D Senzig	Spring Meeting

Meeting Close-Out | Lead *Ian Redhead*

Ian began the session by commending Julie on how the Office is being run, the new staff acquisitions, and the creation of the new AEE-500 Energy division. He continued by noting that the recommendations from the committee will be the same and acknowledging the work on SAF, the issue of zeroing of funding, and the partnership with NASA. He then added that they will have to include the recommendation to have DOD participate on SAF and Brandon remarked that it should also be so on PFAS used for firefighting, to which Melinda remarked that EPA is more of a challenge. Julie asked whether the airport subcommittee was already addressing it and Melinda responded that there are a lot of gaps and that FAA legal is still trying to address the issue of responsibility. Chinita Roundtree-Coleman remarked that they are addressing them, but that Anna could reach out to the Airport Committee DFO, suggestion that was noted as an action. Ian then suggested that he and Melinda will also need to discuss further, and Melinda remarked that she will review the Airports Committee documentation.

The discussion then moved to the topic of the presentations and Ian stated that the DOE presentation was very impressive and that he was looking forward to more presentations by other partners as they will be also helpful for the staff themselves. Julie noted that in January the Office had an in-person office meeting and it will be followed with more detailed discussions on the work of the Office. Ian added that the REDAC is also a very good meeting to attend. Steve then remarked that the upcoming meeting will be the first time for the new administrator to hear from this committee and that all the savings from the environmental programs should be highlighted in the preamble. Julie commented that he has been focused on basics right now so our type of discussions have been aimed to the deputy. There was agreement that the highlights will be added, and Steve added what has been already done should be advertised. The discussions concluded with considerations regarding CAEP and the needed leadership in that arena. Barb concluded by remarking that storytelling in the presentations has much improved and that the presenters should remember to drive the point home.

The meeting concluded with the selection of the next Fall meeting dates, August 27-28, and next Spring meeting dated February 25-26, 2025.

Action items	Person responsible	Deadline
Reach out to the REDAC Airports Committee on the issue of addressing PFAS	A. Oldani	Spring 2024

Adjourned at 4:00 pm on Wednesday, February 21, 2024

Attendance-

Day 1		Day 2	
Juan	Alonso	Juan	Alonso
Steve	Alterman	Steve	Alterman
Chris	Dorbian	Nicole	Didyk-Wells
Barbara	Esker	Joe	Dipardo
Charles	Etter	Chris	Dorbian
Kenisha	Ford	Rudy	Dudebout
Ana	Gabrielian	Barbara	Esker
Fabio	Grandi	Charles	Etter
Brandon	Graver	Kenisha	Ford
Bahman	Habibzadeh	Catalin	Fotache
Mark	Hale	Joshua	Glottmann
Peter	Herding	Fabio	Grandi
Sandy	Lancaster	Brandon	Graver
Prem	Lobo	Sandy	Lancaster
Julie	Marks	Prem	Lobo
Dimitri	Mavris	Alaina	Loving
Monique	Moore	Mohammed	Majeed
Andrew	Murphy	Ty	Marien
Eric	Neiderman	Julie	Marks
Anna	Oldani	Dimitri	Mavris
Arthur	Orton	Monique	Moore
Melinda	Pagliarello	Andrew	Murphy
Ian	Redhead	Anna	Oldani
Chinita	Rountree-Coleman	Melinda	Pagliarello
David	Senzig	Katherine	Preston
Shivanjli	Sharma	Ian	Redhead
Jeetendra	Upadhyay	Chinita	Rountree-Coleman
Don	Wuebbles	Adam	Scholten
Daniel	Williams	David	Senzig
Joe	Zelina	Shivanjli	Sharma
		Jeetendra	Upadhyay
		Rich	Wahls
		Joe	Zelina